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SOYBEANS

Excerpts from 1923 Annual Reports of State and County Extension Agents

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This circular is one of a series issued by the Office of Cooperative Extension Work as a part of its informational service to State and county extension workers. It was compiled at the request of R. E. Underwood, County Agent, Gettysburg, Pa. The material contained herein is not released for printed publication.

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SOYBEANS*

Introduction

The soybean is probably the most popular of our newer legumes. It fits easily to a rotation as a cultivated crop and can be used for soil improvement, hay, grain, and concentrated feed. Each year a larger acreage is planted with corn for hogging off.

The 1923 reports indicated work with soybeans in 45 States; and 1067 agents reported a total of 15,552 demonstrations, an increase of 90 per cent over the number of demonstrations in 1922. The total number of farmers reported changing practices with regard to soybean culture in 1923 was 79,824 or an increase of 40 per cent over 1922.

Colorado

Soybean seed was obtained for all farmers who wished to try out this crop. For the most part the seed obtained was for the early varieties. Five farmers planted a single variety, five planted two varieties, and eight planted three or more varieties to determine the kind most desirable from the standpoint of yield of seed and fodder, and of early maturity. The beans have not been threshed; so it is impossible to report the yields of seed per acre, except on some of the plots where short rows were threshed by hand and the yield figured from this weight.

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* No attempt is made to cite all references to soybeans in this circular. Only selected extracts showing methods employed and results in a number of States are included. Owing to differences in terminology used in the various States and to other local conditions the information herein should be reviewed by the State subject-matter specialist concerned before incorporating any part of it in the extension plans for the State.

In one test of nine varieties, the Wisconsin Early Black was one of the first to mature and gave the best seed yield. Also, this variety produced one of the highest yields of hay, being exceeded only by the Manchu variety which did not mature well. In the tests the latest maturing variety was the Medium Green which appeared to be the heaviest hay producer. When it was cured, however, it was very light and did not weigh as much as either the Early Black or the Manchu.

The varieties used in these tests are given in the order of yield of seed:

Wisconsin Early Black	Chestnut
Madarin	Manchu
Black Eyebrow	Medium Green
Mandarin	Hay Mixture
Ito San	

Our deductions from the trials of the soybean crop the last two years are as follows: (1) Early varieties of soybeans will mature well in this county; (2) in a favorable season they will produce a good yield of hay and seed; and (3) best results are obtained by planting in rows and by handling the ground as for corn. - J. E. Morrison, County Agent, Sterling, Logan County.

Delaware

For the past five years the value of inoculating soybean seed has been thoroughly demonstrated by the county agent; and with the amount of publicity that has been given this project, one might think it should be considered a finished job. However, there are a lot of farmers who planted beans this year without inoculating them; and numerous requests regarding inoculation came to this office, especially from communities where soybeans had never been grown. Fourteen demonstrations were carried out this season with very interesting results.

A demonstration on the farm of J. T. Lank was to show the results of soybean inoculation on the crop following soybeans. In the spring of 1922, Mr. Lank sowed 10 bushels of seed which had been inoculated by the county agent, and in the center of the field he sowed 2 bushels of seed which had not been inoculated. At harvest time there was a striking difference in the growth of the beans. The field was sowed to winter oats, and this spring there was a noticeable difference in the growth of the oats. The county agent and Mr. Lank carefully cut the oats from 15½ square feet in the plot that had no inoculation the year before, and the same amount from the part of the field that had been inoculated. The two bundles of oats were exhibited at the State and county fairs, after which the agronomist at the experiment station threshed the oats and computed the yield on an acre basis. The sample taken from the plot that had been inoculated yielded 33½ bushels, and the sample from the uninoculated plot yielded 11 8/10 bushels. Everyone who saw this field of oats agreed that the yield was at least three times as great where the beans were inoculated. - M. C. Vaugh, County Agent, Georgetown, Sussex County.

Illinois

During the past three or four years the farm bureau has conducted an active campaign to increase soybean production. Prior to 1922 few soybeans were grown for seed or hay. The success of the 1922 demonstrations led to a marked increase in the 1923 acreage. While the weather during harvest time was quite favorable, most of the farmers who grew soybeans this year for the first time were well pleased, and a number of others are planning to plant them next year.

In order to answer the number of questions relative to varieties and inoculation two demonstration fields were planted in the spring of 1923.

The following varieties were planted on the farm of H. A. Payne in Lamoine township: A. K., Midwest, Ohio 9035, Manchu, Ito San, Peking, and Virginia. Inoculated and uninoculated seed of the first five varieties were planted side by side. The soil on which this demonstration was located was yellow-gray silt loam. In the Farm Bureau office the beans were inoculated by the muddy-water method and were planted on May 31. These beans made fair growth, but the yield was reduced by the dry weather during July. Some striking differences were seen in the varieties, but there was no apparent difference in the foliage until after the middle of August. An examination of the roots showed that the inoculated beans had developed a good nodule formation and that no nodules were found on the uninoculated plants. On September 4, when a field demonstration was held at this place, the color of the foliage on the inoculated plants was distinctly darker than that of the uninoculated ones. This difference could readily be seen at a distance. The attendance at the field meeting was about 60. Interest in this project is rapidly growing, and when soybeans are more generally known they will add materially to the wealth of the community.

On June 1 another demonstration field was planted on the farm of S. J. Grigsby. The seed used in this field was procured through the cooperation of the agronomy department of the University of Illinois. A part of the seed was sterilized and the remaining part inoculated in the agronomy laboratories. The varieties grown were Virginia, Wilson 5, Illinois 13-19, Ebony, Ohio 9035, Midwest, Manchu, and Black Eyebrow. The soil on which this field was located was brown silt loam and had been in sod for several years. All of the varieties made a good growth, and there was no apparent difference among the plants grown from inoculated and sterilized seed at any time during the season. On September 4, a demonstration meeting was held in this field. On September 15, records were taken to determine the height, percentage of plants inoculated, and the average number of nodules per plant. The height is the average of 20 plants, and the data on inoculation are the average of 10 plants from each variety.

The summary of the notes obtained at that time is included in the following table:

Effect of inoculation and sterilization on eight important varieties of soybeans

Variety	Height		Percentage of plants inoculated		Nodules per plant	
	Inoculated	Sterile	Inoculated	Sterile	Inoculated	Sterile
Virginia	63 in.	62 in.	90	20	.2	.4
Wilson 5	55 "	51 "	50	10	.5	.1
Illinois 13-19	55 "	52 "	20	20	.2	.2
Ebony	36 "	36 "	20	20	.3	.3
Ohio 9035	31 "	29 "	30	0	.3	.0
Midwest	37 "	34 "	40	40	.4	.4
Manchu	34 "	37 "	10	0	.1	.0
Black Eyebrow	36 "	34 "	0	0	.0	.0

A number of growers were assisted in procuring seed adapted to this locality and were instructed in the method of inoculating seed, preparing the seed bed, cultivating, harvesting, and storing the crop. - R. C. Donaghue, County Agent, Macomb, McDonough County.

Prior to the information of the farm bureau in this county the acreage grown to soybeans was very small. The farm bureau has pushed the growing of this crop until it is occupying an important place in our agriculture. The soybean has been advocated because it is a legume crop which furnishes feed and a grain crop which fits into the rotation and will take the place of oats. It is destined to become a standard crop here, if it has not already become one. Because of the newness of the soybean crop it was necessary to give it considerable study, so probably more time was given to it than any other crop.

It has been learned that inoculation is the first essential to the successful growing of soybeans, that a full and complete inoculation is not obtained the first time the crop is grown, but that good inoculation can be obtained if the following precautions are observed: Take the soil for inoculation purposes from a field that has grown two crops of well-inoculated soybeans; take soil that is not sour, but preferably that has been limed recently; and get a good coating of the inoculation on the beans.

Careful study has been given to varieties; and while there may be a need for changes in the future, it now appears that a comparatively small number of varieties will fill the needs of this county. The Manchu and A. K. seem best for threshing purposes and the Mongrolor Midwest and Ebony best for hay and for planting with corn.

If the corn fields can be pastured, the planting of soybeans with corn has been recommended as a good farm practice and as a protection against the second brood of chinch bugs. There were cases where the beans were left out of part of the field, which demonstrated plainly that they did not serve as much protection. This practice is to be recommended wherever the corn fields can be pastured and in all cases as long as chinch bugs remain in the county.

The methods of harvesting the crop have been carefully studied, and there is no doubt that the use of a grain binder is preferable to any other plan that has been developed at present. The beans can be easily threshed with an ordinary grain separator if a few minor adjustments are made. - Allen L. Higgins, County Agent, Sullivan, Moultrie County.

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Indiana

In various parts of the county, demonstration meetings were held to point out the good features of soybeans. Government inoculating material was obtained for over 40 farmers, and soil from a field which had been well inoculated was furnished free of cost to farmers who purchased the seed from the Cooperative Service Co.

Getting a field properly inoculated is one of the big problems in soybean growing. A demonstration was held at Frank Craig's farm where more than 30 interested farmers saw the varieties of soybeans which were being tried out. The Midwest variety seemed to do best on this field and the Morris variety showed up well. One of the outstanding features of the entire demonstration was that on the field where the beans had not been inoculated, the plants had a yellow cast, while the inoculated plants were dark green. In pulling up these plants, it was noticed that nodules were on the ones where the beans had been inoculated, and there were no signs of inoculation on the other plants.

One demonstration was conducted on George Riggle's farm and one on Rolla Harrel's farm in the northern part of the county. Mr. Riggle had 32 acres of soybeans planted in rows, the first of which was planted on May 28 and the last on July 30. The field which gave the best results was planted July 15. Most of the beans were inoculated, and application of 2-12-6 fertilizer was made. The soil was acid, but the beans were properly treated and gave excellent results. The ground was plowed deep and well fitted before the beans were planted. Mr. Riggle stated that the secret of growing soybeans on flat land is to plow deep and cultivate deep until the beans are planted, using a single shovel plow to open up drains so the water can be carried off.

The demonstration on Rolla Harrel's farm consisted of 11½ acres of beans which produced 4 tons of hay per acre. Mr. Harrel has been growing soybeans for the past three years. Anyone passing along the road from Middlefork and Dupont can see the results being obtained with soybeans. This demonstration plot had been cultivated for a number of years, yet these beans were about 4 feet high at the time of the demonstration. Before this land was put to soybeans, it was covered with "crawfish chimneys" which are an indication of flat, acid, thin land.

At the demonstration, Mr. Harrel stated that soybeans are bound to leave the land in excellent condition for coming crops, and that he found that 100 pounds of 12-12 fertilizer give good results. While, upon examination, some of the plants were found to be well inoculated, the demonstrator further stated that where soybeans are planted two years in succession the inoculation is usually much better the second year.

Another demonstrator was W. S. Walker who had 46 acres of soybeans. On a field of 12 acres of these beans, Mr. Walker had 75 hogs that were turned in when they weighed 50 to 75 pounds. These hogs had been fed bran and shorts, but this feed was discontinued when they were turned into the bean field. About a month later the hogs weighed 160 pounds each, which shows that hogs will make rapid gains if fed soybeans alone. In addition to the hogs, 10 head of cows were turned into the bean field. These cows had received blue-grass pasture, four pounds of bran and shorts per day, and alfalfa, but this was discontinued after they were turned on the soybeans. The cows gained 5 gallons of milk and produced $3 worth more of butterfat per week. Figuring the hogs to make an average gain of 50 pounds, the 12 acres of soybeans produced 3,750 pounds of pork, which at 8 cents per pound, would mean $300 worth of pork. In addition, a saving of $52.50 in cow feed was made. This is a total of $352.50 for the 12 acres, not taking into consideration that the stems and stalks are left to improve the ground for succeeding crops. - B. H. Doddridge, County Agent, Madison, Jefferson County.

1867

Kansas

Interviews of 10 farmers who planted soybeans last year were run in the local papers and the farm bureau news. This year the discussing of culture and utility of soybeans at nine farmers' meetings and a poster calling to the farmers' attention the fact that it was time to get the seed, put soybeans on 57 farms which did not have a single bean last year. A total of 6,890 pounds of soybeans were ordered from growers in Missouri. This was found to be very satisfactory as we got clean, reliable certified seed for a moderate price.

A good stand of beans was obtained in all but two instances. This was mainly due to very early planting. This year we found the best planting dates to be between May 15 and 22, but beans seeded as late as May 30 produced a good crop of seed and matured before frost.

I find that the farmers have a tendency to plant the beans too thin when they plant them with corn. This is a drawback when the crop is to be used for silage as the plants become sprangled out, and it is next to impossible to gather them with a corn binder. Not less than 8 pounds of seed is satisfactory with corn; and when seeded alone, it is best to use from 12 to 15 pounds.

This year the Midwest variety was seeded mostly, but some used the Morse variety. Virginia beans are going to be popular for silage and hay, but the scarcity of seed makes this variety prohibitive just now. The Midwest variety yielded from 12 to 15 bushels per acre.

As the soybean is a fine protein supplement to corn, it has found a place in the feeding of hogs. The practice of planting the beans with corn for silage is becoming widespread, but the use of the beans for hay is rather indefinite. This year six men planted beans using 1 bushel per acre for seeding. Two of these farmers reported a yield of 1½ tons of hay per acre. One followed his hay crop with alfalfa and reported a stand second to none. The grasshopper is the only insect that affects this crop. Chinch bugs do not like to go through it. As soybeans and fowl ground are not a good combination, the beans must be cultivated and kept free from weeds to get the best results. - Joe M. Goodwin, County Agent, Effingham, Atchison County.

Maryland

During the winter and spring, farmers' meetings were held at which time the soybean problem was discussed, and numerous farmers were induced to plant soybeans. Where the farm-bureau locals were functioning, local leaders were appointed to be responsible for getting a certain number of acres planted in their community, such number depending upon the community program. This was done in Frederick, Montgomery, and Baltimore Counties. In Montgomery County the order for soybeans was pooled.

Many county agents and communities made this problem an important part of their programs. The problem was kept before the growers by appropriate publicity. Since the lack of seed is the greatest limiting factor in the rapid spread of soybean growing, it is important to develop as many seed growers as possible. This brings a number of problems. Seed growers have to learn by experience how to grow the beans, how to take care of them, how to market them, and last, but not least, to stick to the varieties best suited to Maryland soil.

The inoculation of most legumes is very important, especially the inoculation of soybeans. As the nodule forming bacteria of this plant will not grow on any other legume, the soil for soybeans can not be inoculated by any other legume. Also, it has been discovered recently that not only is the above true about soybean inoculation, but there are at least a dozen strains of these bacteria especially adapted to certain varieties of soybeans. For example, the strain best suited for the Mammoth Yellow will not give good results when applied to the earlier varieties.

To make it easier for the demonstrators to get inoculating material and for the experiment station to study a number of questions relating to soybeans, a cooperative arrangement was made. The experiment station supplied inoculating material, at cost, to all demonstrators making application; and the demonstrators, with our cooperation, supplied the information asked for. Under this arrangement, 7,249 tubes of inoculum were sent to 704 soybean demonstrators. Each tube will inoculate a half bushel of seed which is planted at the rate of 1 to 2 bushels an acre for hay and ½ bushel for seed.

Questionnaires were prepared and sent to each demonstrator. These were forwarded to the county agent when made out, and the county agent forwarded them to the experiment station. As it was necessary to get the needed information while the legume was at the height of its growth, the county agent and the extension agronomist spent much time inspecting the fields, estimating the yield of the general plot and the uninoculated check, getting samples of the plants showing nodules, and taking samples of the soil where the inoculating material took well and where it did not take. On the whole, a decided increase was noticed on the inoculated beans over the uninoculated.-W. F. Oldenburg, Extension Agronomist, University of Maryland, College Park.

In 1922 approximately 300 acres of soybeans were grown in this section. In this county a few men who had grown soybeans during this period had them ground to help make out their dairy ration. This ration consisted of 800 pounds of ground soybeans, 800 pounds of ground corn, and 400 pounds of cotton-seed meal, or peanut meal. According to analysis of this feed, it contained approximately 19 per cent of digestible protein. This home-grown feed saved the farmers around $10 per ton. In every case soybean growers were pleased with the feed. Therefore, it was decided to put on a drive to increase the acreage of soybeans. Meetings were arranged in the locals and were attended by specialists from the extension service and the president of the Montgomery County farm bureau. The goal was doubled, which means that 1,000 acres of soybeans were grown in this county in 1923. In each section, local leaders were selected to sign up men in their communities to grow soybeans.

The extension service furnished 186 men with inoculum which cost $500; but if it had been purchased from commercial firms, it would have cost approximately $1,600. This was a saving of $1,100 to the farmers.

In a few instances where the farm acreage was small, it was impossible to plant the beans at the time recommended. The farmers plowed the wheat stubble and planted the beans in July. The yields were much smaller than when the beans were planted early. However, the farmers were pleased with the result and were able to have hay for their cattle without purchasing it. In previous years we recommended that the beans be planted around June 10, but by experience we have found that this was a mistake, as beans planted around May 10 not only yield better but it is less difficult to cure the hay. It takes about 100 days for the hay to mature. When the beans are planted around May 10, the farmers can make their hay during the latter part of August.

1867

As the high cost of seed is one of the limiting factors in soybean growing, we recommended that each farmer grow enough seed for his own use. This has been done in many cases, and other farmers have found that it is not only profitable to grow their own seed but to put out a larger acreage for a cash crop. In this county the method of seeding has been to drill the same as for hay only to use less seed. We have found that approximately 1 bushel and 1 peck to 1½ bushels per acre is the correct amount to be sown. For hay it has been found that by sowing 2 bushels of beans per acre, better results are obtained than from sowing 1½ bushels.

Of the 186 men furnished inoculum, results have been obtained from 119. Our seed yield has been from 16 to 20 bushels per acre. A yield of approximately ½ ton more was reported where inoculum was used over the yield of the check plot. Where instructions for soybean growing were carried out, the average yield was about 2½ tons per acre. - W. C. Snarr, County Agent, Rockville, Montgomery County.

Minnesota

This year 53 farmers in 17 townships cooperated in continuing trials with soybeans started in 1921 and 1922. The reports of last year indicated that Manchu and Black Eyebrow beans gave much better results, especially when used for silage. For this reason Manchu and Black Eyebrow were largely used in 1923. In order to get a comparison, eight farmers grew two or three different varieties.

To date, reports indicate that the soybeans grew from 30 to 40 inches high, and practically no trouble was experienced in cutting. The year 1923 was, generally speaking, a poor soybean year. The discussions heard at different farm-bureau meetings indicate that more farmers will grow soybeans as an emergency crop in 1924. The importance of having good seed and planting it properly was made evident at one unit meeting where one farmer showed Manchu soybeans which grew from 36 to 42 inches high and stood erect, while another farmer in the same community reported that his beans were broadcast and did not grow more than 6 to 8 inches high. Except in a very favorable season and on very fertile soil, the practice of broadcasting soybeans is not likely to prove successful. Soybeans which are to be used for seed must be carefully handled when curing previous to threshing, or a very low germination will result. It is important to use only first-class seed that comes, as far as possible, from local producers. It is believed that, as a result of soybean trial conducted the past three years, more seed will be produced locally and that if there is not sufficient supply of good seed of recommended varieties, it can be obtained from local dealers. - J. B. McNulty, County Agent, Lewiston, Winona County.

South Carolina

The soybean is an entirely new crop to the majority of the farmers of South Carolina. The specialist realized that to develop this crop into a cash crop, the farmers had to be shown that they could grow soybeans and that they could sell them. The second project was undertaken first. In South Carolina, there are 75 oil mills. These mills were canvassed as to their using soybeans for crushing purposes. In replying, every mill stated that it could use soybeans and was anxious to obtain them for crushing.

The following is quoted from a letter of Russel Acree, secretary of the South Carolina Cotton Seed Crushers Association: "We know there is a wide market for the oil and meal obtained from soybeans and the oil mills are prepared to buy beans, suitable for crushing, at a fair price based on the value of the product obtained from them, provided there is offered a sufficient quantity to enable the mills to sell the products wholesale."

Educational articles relating to the value of soybeans as hay, as a grazing crop, as a soil-improvement crop, and as a cash crop, using the above letter, were written and published in the News Weekly Notes and the papers of the State. At the district meetings of the county agents, these facts were presented to the agents. The following results were obtained: 29 agents listed soybean work; later 8 more took on the work, leaving 1 county agent who did not list any bean work.

In showing the farmers that they could grow soybeans, the specialist and the county agent visited farms; talked at farm meetings; instructed the farmers in planting, cultivating, fertilizing, and harvesting; and located sources of seed.

Farmers were not urged to plant large acreages the first time, nor was it the purpose of the specialist to encourage them to grow the beans for sale as seed alone. The specialist's object was to induce the farmers to prove to themselves that they could grow soybeans, regardless of the use that was to be made of the crop, the acreage planted, or the variety of bean used. After the farmers see that they can grow the crop, the larger acreage for commercial purposes, the cash crop, will follow. Demonstrations were conducted for hay, grazing, and soil improvement. The most reliable figures that can be obtained at this time give the total acreage as 15,000 with a probability of its being 20,000.

Another indication of the increase in seed production is the fact that the Gordon Soybean Harvester Co. did not sell a machine in the State in 1922, but they have sold 58 machines during 1923. As these machines cost $140, it shows that the farmers are investing in machinery for continued soybean production. - C. P. Blackwell, Extension Agronomist, Clemson Agricultural College, College of Agriculture, Clemson College.

Virginia

I have felt that soybeans are a crop of economic importance to the farmers of the valley and have stressed their importance and urged the farmers to work soybeans into their crop rotations. At first, it was hard to get farmers to give them a trial; but a few having succeeded, the acreage this year will amount to probably 4,000 to 5,000 in the county. This year, in particular, gave me an opportunity to demonstrate just how important soybeans are in the production of forage crops in this county. A large number of farmers failed to get stands of grass, and they were forced to grow some additional forage for their livestock. In all cases, I recommended the mixture of soybeans and Sudan grass.

In a few instances the yield of this crop averaged 3 tons per acre and as some of the farmers have fed this forage, they are very enthusiastic in their praise of it as a forage crop.

In addition to growing soybeans for forage, quite a number of farmers grow them for seed production. Of course, most of these seed-production plots are small, being from 1 to 3 acres in size. However, in one case, we had a man who sowed 12 acres in rows and cultivated them according to instructions. He also purchased a Scott harvester; and as the weather conditions were excellent, he was much pleased with the success he had in harvesting his seed.

The yield was not as much as we had expected because of the extreme dry weather in the early part of the summer. The beans did not reach the height they normally would have and were so near the ground the harvester was unable to gather them. The yield was 200 bushels for the entire 12 acres. - P. C. Manley, County Agent, Staunton, Augusta County.

Summary

By far the most important phase of the soybean work is variety demonstrations to determine the varieties best adapted to each locality and the work of increasing seed production to supply the demand for the best varieties of seed. As some of the articles in this study indicate, there is still need for demonstrations to show the value of inoculation. This is forcefully illustrated by the fact that last year an agent reported that a farmer understood that soybeans must be inoculated before they would grow successfully. He knew there was an abundance of bacteria in sour milk, so he attempted to inoculate his soybeans with this material but obtained no beneficial results.

Through the variety demonstrations, most of the States have been able to determine one or two leading varieties of soybeans to recommend in their State. Probably the lack of seed of the right variety, more than anything else, has limited the increased acreage of this crop. In many States, soybeans are now considered one of the important crops in a rotation. This is especially true in sections where acid soils or the inability to obtain good seed have made it difficult to grow clover.

In addition to the use of this crop for seed and feed purposes, there is a growing demand for soybeans as a source of vegetable oil, and certain varieties of soybeans have been developed for this purpose. They will produce a fair income when grown for oil purposes, although usually not as great an income as when grown as a concentrated feed or forage.

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